

# Pilot plant for reclamation

A \$7.5 million experimental reclamation centre could be in operation in Metropolitan Toronto in 1975, Environment Minister William G. Newman announced recently.

In a statement to the Legislature, Mr. Newman said he expects construction to get under way this fall on a site adjacent to Metro's Dufferin Street incinerator. In this location, he said, the centre will fit right into an existing waste handling system.

"The initial plant will include a paper and cardboard recovery module, a metals recovery module and a composting module. These categories represent about 80 per cent of the total volume of refuse entering a plant and they provide the most readily marketable materials," Mr. Newman said.

## MODULES

Experimental modules dealing with other processes can be added later without interrupting plant operations.

"In this project, we will have a comprehensive research facility thoroughly monitored and dealing with enough waste to allow us to develop the most practical and economical methods of reclamation. At the same time, this plant will be developing a Canadian technology in waste recovery," Mr. Newman said.

He said the plant would be more than a research centre. It will be a functioning facility capable of handling 200 tons of Metropolitan Toronto's garbage a day.

On this basis, Metro is being asked to share the total cost of the project with the province of Ontario on a one-third, two-thirds basis. Environment Canada has been represented on a technical committee working on plans for the centre, he said, and the federal government has been asked to participate in the financing of construction and operation of the plant, but as yet no commitment has been received from Ottawa.

## SHARE COST

"If the federal government should decide to participate in this project, we would hope that the capital and operating costs would be shared equally by the three levels of government."

Since the facility plays a dual role, research and practical reclamation, both Metropolitan Toronto and the Ministry of the Environment will be

providing staff for the centre, he said.

In announcing the centre, Mr. Newman tabled a 320-page report prepared by consulting engineers commissioned by a joint technical committee composed of representatives of three levels of government. In addition to proposing the reclamation plant, the report reviews international developments in resource recovery.

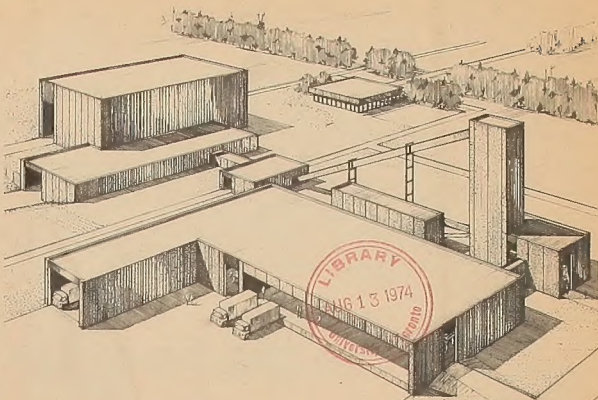
## OPEN ARMS

The announcement came about a week after Mr. Newman offered \$5 million in provincial financing for another reclamation operation—the Watts from Waste program to generate electricity at Lakeview Generating Station in Mississauga using Metro garbage in the fuel mix.

Metro Chairman Paul Godfrey, joining Mr. Newman in a Queen's Park news conference, said the reclamation centre would be met "with open arms" by Metro. "This project represents what I am convinced is the desire of all members of the Metropolitan Toronto Council for a shift toward reclamation and away from landfill as the major alternative to solving our garbage problem."

He continued: "We have been firm in our determination to obtain landfill sites in the past, not because we thought they were the best solution, but because at the time they were the only solution."

(Continued Page 2)



An artist's sketch shows the proposed reclamation centre.

ENVIRONMENT  
ONTARIO

LEGACY

VOLUME 3, NO 3

JUNE/JULY, 1974

## Garbage goes electric

Provincial financing totalling \$5 million was offered recently by Environment Minister William G. Newman to launch the proposed Watts from Waste project to generate electricity from garbage fuel at Lakeview generating station.

The financing involved \$3.5

million for Ontario Hydro to fund the necessary modifications to the generating station to permit the use of processed wastes in the fuel mixture and \$1.5 for Metropolitan Toronto to assist in the cost of processing equipment for a transfer station planned for Etobicoke.

"I hope, with this commitment by the province of Ontario, that Metropolitan Toronto and Ontario Hydro will be encouraged to carry this project forward as quickly as possible," Mr. Newman told the Legislature.

The Watts from Waste proposal has been guided for the past year by a committee appointed by the Minister of the Environment. Its members included representatives from the Ministry, Ontario Hydro, Metropolitan Toronto and Mississauga.

The estimated total capital cost involved is \$15 million, Mr. Newman said, to produce a system that can process approximately 1,000 tons of solid waste a day.

"We are concerned with the volume of solid waste that is being produced in this province and our aim is to reduce this volume and to recover the useable materials that are now being wasted in landfill operations," Mr. Newman said. "This forward-looking approach by Metropolitan Toronto and Ontario Hydro is a large step in that direction."



Metro Chairman Godfrey, Mr. Newman and Ken Morrish, Metro Works Committee chairman, discuss the reclamation centre.

## Students survey cottage lakes

A sanitary survey of lake-shore properties in the Peterborough, Muskoka and Lake of the Woods areas is presently underway as part of the Ministry of the Environment's cot-

tage pollution control program.

The inspections are carried out by specially trained university students who hope to visit over 3,500 establishments this summer. They are talking to cottagers on the following lakes: Clear, Kahshe and Wood in Muskoka, Chandos and Looncall in the Peterborough area and Lulu, Longbow, Sioux Narrows and Nestor Falls in the Lake of the Woods area.

The students collect information about the private waste disposal methods used at the establishments in the area. Among other things, they

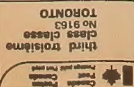
want to know the number of occupants at the cottage, details of the plumbing installation, location, size and age of the septic tank, cesspool or pit privy, topography of the lot and will obtain a sketch of the property showing positions of the septic tank, well, lake and property lines. They also take samples of the drinking water for testing.

If the data and samples indicate that the disposal facilities are inadequate, a Ministry abatement official will check the findings. If a problem does exist, he will contact the owner to discuss and arrange an abatement program.

Inside  
LEGACY

- \* SWARU—a special report from Hamilton.
- \* Classics—Environment Ontario tests vintage cars for emissions.
- \* Transportation—the cleanest carriers of cargo.

University of Toronto Library,  
Seymour Department,  
Toronto 181, Ont.



# Research a key to future plants

(Continued from Page 1)

The reclamation centre would not have a significant immediate impact on Metro's daily waste load with its 200 tons per day capacity, he said, but future plants could be expanded to increase capacity manifold. In context with other experimental projects under way, the potential impact of reclamation is more significant, he said. The Watts from Waste proposal at Lakeview Generating station "if it works, is going to take about 1,100 tons per day of Metro's garbage. That's quite a bit when you consider that Metro

has between six and seven thousand tons."

## STEAM PLANT

He also mentioned a city of Toronto proposal to generate steam for heating downtown buildings by using garbage in the fuel mix as another experiment that could affect 20 to 25 per cent of Metro's garbage.

The report on the reclamation plant was submitted to the Minister by a joint technical committee for resource recovery appointed last year by Mr. Newman's predecessor James Auld.

The members were: Wes Williamson, Ministry of the

Environment, Chairman; Eric Sanderson, Environment Canada; Ian McKerracher, Metropolitan Toronto works department.

## OBJECTIVES

The committee commissioned Kibborn Engineering Ltd. to undertake the development of a resource recovery research centre which would include a functional reclamation plant. The objective was to design a facility that would be both a functional centre and a research laboratory to develop the technology and processes for refining reclamation systems.

The objectives set for this

facility were:

- To investigate and compare the suitability of alternative processes and equipment for the separation and reclamation of components from municipal waste.

- To determine the feasibility of separation and reclamation plants as an alternative to present methods of disposal.

- To examine the feasibility of staged or modular introduction of such plants.

- To investigate the additional processing required for the marketing of reclaimed materials.

- To investigate alternative outlets for such materials,

methods and costs of handling.

- To develop criteria by which the capital and operating costs of various types and sizes of plants can be reliably estimated.

- To develop criteria by which environmental effects, including the consumption of energy, of reclamation can be gauged so that a reliable and complete comparison can be made between alternative processes.

- To provide facilities to other agencies and to industries for the installation and testing in practice of equipment, instrumentation and processes related to their fields.



RALPH MOORE

## The big beat for Ralph Moore

Regional profile—first of a series

From Algonquin Park's southern reaches to the fifty-fourth parallel, from White River to the Quebec border—Ralph Moore has a long beat to patrol.

Mr. Moore was appointed regional director for northeastern Ontario when the Ministry of the Environment reorganized April 1, 1974, into a regional structure.

It's a new phase of operations for a young Ministry—two years old at the time of

reorganization. And it's a new life for the six regional directors appointed to take charge of delivering Ministry services to the people of Ontario. It means a full load of responsibilities.

Stationed in Sudbury, Mr. Moore is challenged with protecting the environment in some of the province's most beautiful areas and some of the most productive areas in terms of natural resources.

"My first job is to get

acquainted with the geography, the people, and their concerns. I had a pretty good briefing on the general needs and problems in the area, but the kind of details we have to know and relationships we have to build will take time. We're off to a good start and I'm enjoying it."

Mr. Moore and his wife purchased a home in Sudbury and from the date of his appointment he planned to acquire a permanent resident

of the community.

Immediately before being named Regional Director, he was chief of the Ministry's pesticides control service, a position he had held since February, 1972. From 1964-72 he was research manager at Niagara Chemical Company, in charge of field research and environmental studies. Ralph also spent 13 years with the Ministry of Agriculture, advising pesticide users in terms of equipment and techniques.

He summed up his approach to the new job: "Undoubtedly, it's a big challenge, and I'd be foolish to say that we won't have problems, even some enormous ones. We're trying a new approach, and for the first while it will be tough. My hope is that the dialogue we're initiating with municipalities, industry and the community will help us to see our environmental needs in a proper light and begin to work together to meet them."

"I've got a fine team of professionals here and I'm very optimistic about our work."

While Mr. Moore is based in the Ministry regional office at 449 Bouchard St., Regency Mall, Sudbury, other areas of the region are served directly by district offices in North Bay, 1500 Fisher Street, Northgate Plaza, and in Sault Ste. Marie, 445 Albert Street.

## Well problems -- who can help?

When a citizen experiences a well contamination problem, it can involve the Ministries of Health, Environment and Agriculture and Food, or all three.

The first person a household should call is the local Medical Officer of Health. He has the authority and the required know-how to deal with most well pollution directly and quickly.

If the Medical Officer of Health finds reason to suspect that the contamination stems from an industrial or agricultural source, he calls in the Ministry of the Environment whose ground water specialists and other experts step in to conduct tests and try to pin down the exact source of the problem. They check the flow pattern and the direction of the ground water and analyze the water in the problem well. Other wells in the area are also tested to see how far the contamination might extend.

In most cases, this testing and analysis produces a good indication of the source of the problem, but not always. There have been situations where a particular source is suspected, but after investigation it is found that the ground water flow is away from the area instead of towards it. In this situation, the investigative staff must rely on chemical analysis of the problem well or wells, as well as other portions of the overall Ministry investigation.

The Ministry looks at more than one source originally suspected by the MOH. Other farm operations in the area are investigated if it is a farm-related problem, or similar possible industrial sources are looked at if it is suspected that industrial waste might be the problem.

Some of these problems can at times become quite complex, and it is found on occasion that the situation calls for a great deal of research.

During these investigations, the Ministry can do a great deal of good, not directly related to the original complaint. If it is discovered that an industry is disposing of wastes improperly or discharging any undesirable effluent where it should not do so, the necessary steps will be taken to see this is corrected immediately. This is done whether the industry in question is responsible for the immediate problem situation or not. If there is a problem with farm wastes in the area, the Ministry of the Environment, working with the Ministry of Agriculture and Food will find ways to improve farming methods and waste-handling practices.

However, this sort of abatement procedure, while beneficial to the environment, does not always solve an immediate problem with a particular well.

The reason is that wells draw their water from the ground around them. This

water generally moves very slowly and the removal of contaminants in the ground water is also correspondingly slow. In addition, some water pollution problems persist in ground water. There are some chemical compounds that still cause taste and odor problems even when diluted to almost undetectable levels. Bacteriological problems and well problems related to bacteria are also persistent. In many cases, bacteria contaminating wells live and multiply in the soil and in the ground water upon which these wells draw.

If a well owner's problem is traced to a neighbour's faulty septic tank system or a nearby farm or industry, and these links can be established firmly with scientific evidence uncovered by Ministry experts, the well owner has a strong case for civil action to recover damages. In many cases, an industry for example, will settle out of court and pay for any problems it has caused simply for the sake of good public relations and to maintain its status as a good corporate citizen.

Industries and farm practices cannot be singled out as the only reason for well contamination problems. The major source for contamination is bacteriological contamination and one of the main causes for this is simply growth. A community, expanding at a fast pace eventually reaches the point where there are too many wells and

too many septic tank systems for the groundwater supply to handle. At this point, the only solution is for the Ministry and the local municipality or a group of small municipalities to get together in the development of water and sewage facilities for the area.

These facilities can be quite costly if a community has to undertake them on its own. For this reason, the Ministry encourages area treatment plans and also offers capital construction grants and financial assistance to keep these costs within reason. The outright grants for capital construction can range as high as 75 per cent.

In summation, there are four main actions available.

1. If the Ministry finds a general problem in an area and deduces that this problem is likely to persist, assistance is available to the municipality for an overall solution.

2. If there is a specific well problem from an industrial or farm source, the Ministry will try and provide evidence for the well owner's use and Ministry personnel see to a cleanup of the source.

3. If there is a specific problem from other sources, or any health hazard, the Medical Officer of Health handles it.

4. If the well owner suspects a water problem, or is just worried in case one might arise, the first person he should contact is the Medical Officer of Health.

## Sulphur pile

With pollution controls pulling more and more sulphur out of oil and gas industry processes, the stock-piles of this element are passing the 10 million-ton-mark in Alberta, according to the Sulphur Development Institute of Canada.

As sulphur production increased as a byproduct of oil and gas development over the past few years, prices and markets for the mineral could not keep pace. So the Institute is busy developing new uses.

So far it has concentrated on compositions for use as low cost building materials for farm storage and animal shelters. Serious examination has been given to using sulphur in asphalt, in concrete and as foamed insulation to protect crops from frost.



A delegate to the London hearing argues a submission to the hearing board.



Chairman D. S. Caverly (right) and Dr. C. A. Martin study a map of the river basin.

## The public is heard in Thames River meetings

Farmers, naturalists, students and municipal and conservation officials all have their opinions on the present and future uses of the Thames River and its tributaries.

They expressed those opinions in a series of public meetings conducted by the Ontario Environmental Hearing Board. The board invited public comment on an interim report on the Thames River recently released in volume in the area by the Ministries of the Environment and Natural Resources.

In Chatham, Stratford, Glencoe, Woodstock and London meetings, farmers in particular expressed concern about any measures that would take flood plain land out of agricultural use.

Andre Kittmer, president of Local 341, National Farmer's Union put it this way to the hearing board: "I think we should be very cautious about taking any agricultural land out of production with highways, shopping plazas, new subdivisions or by building dams to flood it. We are going

to need all our agricultural land if we are to survive, as the food shortage is world wide."

The Wardsville Dam, proposed by the Lower Thames Conservation Authority was also the subject of debate—the effect on land and vegetation and the effect on aquatic life and fish movement; as well as the extent of flood control benefits.

Other briefs discussed water quality, farming practices and their effects on water, the use of fertilizers and the preservation of woodlots and wetlands.

# End of the world--not yet

This opinion article by Len Webster is reprinted from *Water and Pollution Control* magazine.

It has become fashionable to predict an ecological Armageddon. Sonorous keynote speeches anticipate the eclipse of our present era in a predatory title fight for the last gallon of pure water, barrel of oil, and breath of clean air.

As with all messages of good, and ill-fortune, the import becomes less significant with the umpteenth hearing. To get attention today our soothsayers have to forecast ever more imminent cataclysm. A sample reading of the news and views is too often a most depressing exercise.

Fortunately, scattered like pearls on the sty floor, there are glimpses of a more provident future. Sometimes the trend is linear to our present development and therefore recognizable as a goal long sought and now near. Other ideas and possibilities are foreign to our experience—even contrary to our culture and therefore strange, distasteful, even suspect.

Some of this was hinted at when the American Institute of Chemical Engineers assembled four of their most present members at a seminar on "Technologies for Survival to the Year 2000 and Beyond." In turn, Dr. John McKetta looked at energy sources and energy technologies; Dr. Donald Dahlstrom considered pollution control technologies for environmental protection and improvement; Dr. Arthur Humphrey spoke on biomedical engineering and food technology; and Dr. Isaac Asimov told of the practicability of a space colony on the moon as a test station for survival technologies on earth.

### FUTURE GLIMPSES

Each of the speakers has spent a full career in his speciality, and produced a daunting array of data. While Dr. McKetta (fresh that morning from a White House briefing of U. S. energy czar William Simon) forecast only ultimate gloom as the world's known

carbon fuels are expended in more-or-less order, the other three speakers each gave glimpse of hope. Each, however, forecast no promise without significant change in attitudes and habits and customs—time-honoured and comfortable and sacred though we consider them.

According to Dr. Dahlstrom, non-effluent-producing pulp and paper mills have been designed that have the capability of complete water reuse. "In fact," he said, "you'll have to put water into them because there will, of course, be evaporation—or burning off of water—which will go out of a stack as harmless vapour."

### USING WASTE

Dr. Dahlstrom also spoke of complete recirculation and reuse of water in coal production and iron ore extraction—something not done in previous years. He also discussed the use of wastes for power generation; and of finding ways of using the low-level heat deriving from public utilities—"in such areas as agriculture, for

instance."

Dr. Humphrey took this a stage further by suggesting that we will not only be drinking our own wastes in the future, "we're going to be eating them." He described the rudiments of the process: "You have to separate out the fibrous or undigested material from the ruminant. You have to then open up the materials, eliminate the barriers to the heavy cellulose, expose the cellulose to digestion, and then the organic material obtained has to be filtered, dried and recycled."

"You can make it from agricultural wastes. In Finland, for example, they're making food material from a sulfite waste liquor. To do this they strip out the SO<sub>2</sub>, add minerals to the sugars in this spent waste from the pulping operation, ferment it to fix the nitrogen, then filter and dry it.

### FERMENTING

"And another, final example is city sewage or refuse. You can classify it, get the fibrous material out of it and

again digest the cellulose, ferment it and produce a material which we can recycle for food."

Dr. Humphrey made reference to a protein crunch—a shortage of basic foodstuffs for the growing world population. Dr. McKetta had used the term energy crises. The combination of these two factors was described at the seminar as the eventual emergency of two kinds of countries—the oil, or energy imperialists, and the protein imperialists.

The third speaker, Dr. Isaac Asimov is probably better known for his science fiction writings than for his chemical engineering. Dr. Asimov speculated on a moon colony as an escape vent for overused, overcrowded earth.

"It has a number of bad points," he suggested, "like a day that's two weeks long with temperatures that can go up to the boiling point of water, and a night that's two weeks long with temperatures down to absolute zero."

(continued Page 4)

# Cubs howl for ecology

A-KE-LE... A-KE-LE... A-KE-LE... WE'LL DO OUR BEST... DIB, DIB, DIB... DOB, DOB, DOB.

For those unfamiliar with the traditions of cub scouting, this phrase represents a grand howl. Grand howls are used to begin and conclude cub meetings, or, as they are more commonly called, "Cuborees".

On Saturday, June 1, over 300 cub scouts from the western area of the cub scouts of the Greater Toronto Region held their annual Cuboree at the Claireville Conservation Area in Etobicoke. This year,

the organizers of the Cuboree used a theme of ecology for their meeting. Cuboree and ecology, were combined and became "Ecoloree '74".

A representative of the Ministry of the Environment was present to discuss ecology and pollution with the young scouts. Part of the discussion centered around noise pollution and its measurement.

Currently, the Ministry of the Environment is preparing legislation on noise pollution for Ontario. Noise pollution is measured on a noise meter in decibels.

A decibel meter was used to demonstrate various types of noise levels for the cubs. The cubs helped out by displaying their vocal talents in the form of a grand howl. Their howl measures 95 decibels; ten decibels higher than an aircraft flying above the conservation area. One adult present suggested that this is why scout leaders go prematurely deaf.

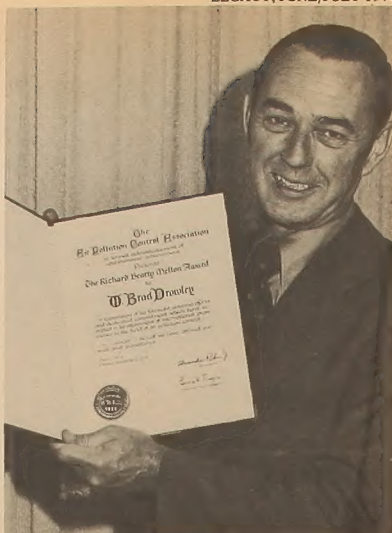
Besides learning about unwanted noise and other forms of pollution, the cubs also participated in games and submitted pollution posters for judging.

Near the end of the day, the cubs held a giant camp clean up. Each cub pack collected garbage in bags and submitted it to Andy Squires, camp chief, for an official weigh in. The winning "pack" collected nearly 20 pounds of litter in under ten minutes.

Scouting and campfires have become synonymous; however this Cuboree ended differently. Since the theme of the day was ecology, cubs concluded their program with a campfire, but without the flame.

"Open fires create air pollution," explained Mr. Squires.

The lack of a warm fire didn't seem to dampen the cubs' spirits; they still had their songs and their grand howl.



## Air pollution control award

W. B. Drowley, Environment Ontario's assistant deputy minister for utility and laboratory services was recently awarded the Richard Beatty Mellon Award by the Air Pollution Control Association. The award is given for outstanding achievement in the field of air pollution control.

Before his appointment to assistant deputy minister, Mr. Drowley was executive director of the Ministry's air and land pollution control division. He was one of the five who made up the first Ontario air pollution control staff in 1957 and has directed air management activities since 1961.

## Future grim for lake trout

Exploitation, as well as pollution, can have a significant effect on the survival of a species, according to Ministry of Natural Resources biologist Val Macins.

More fishermen with more time to fish, and more snowmobiles, trail bikes and swamp buggies to get them to more lakes, are putting the pressure on lake trout, he said.

"In the Kenora area, he said, "in quite a few lakes, catches have dropped so low that anglers have given up on them. Additional stresses, such as pollution and competition (from other types of fish) might well shove a lake trout population beyond its capacity to recover."

He said there is some evidence that trout lakes may take at least 15 years to recover from excessive exploitation.

In 1971, a group of fisheries scientists specializing in oligotrophic lakes predicted a grim future for lake trout if the present rate of exploitation continues. They concluded that within 30 years, lake trout populations would be reduced to a level of insignificance.

Pollution control and restrictions to control the taking of lake trout are essential if this prediction is to be avoided, Mr. Macins said.

# Yes, Virginia, there really is a future

(Continued from page 3)

"It has the hard radiation of the sun showering down on it at all times, and a constant shower of micrometeorites, unprotected by any atmosphere, with a total absence of water."

As Dr. Asimov pointed out, however, this is only important if you chose to live on the surface of the moon. "We would live a few yards underneath the surface by digging out a huge cavern," he said. "We would then be free of the day/night alternation, and the temperature would be equitable because temperature changes are entirely confined to the outermost skin of the moon's solid structure."

"We would have to figure on moon colonists who are perfectly happy on the moon, just as happy as my father was when he came to the United States. I never once heard him say he wanted to go back to the little Russian town in which he'd been born. I imagine the people who are born on the moon would have the same kind of reluctance to go back to the little earth town in which their parents were born."

## LIGHTWEIGHT

Dr. Asimov drew yet another comparison: he (conservatively) estimated his (earth) weight at 180 pounds. On the moon he calculated he would weigh 30 pounds. "I

would enjoy weighing 30 pounds," he said, "and having gotten used to it, I would be as unhappy as the day is long to come back to earth and get back 150 pounds, you know, on my knees, you know."

Dr. Asimov acknowledged that there wouldn't be as much water available as we have on earth, "but there would be enough water for people of a small colony. And, of course, we would recycle everything. We would split the water by electrolysis to produce hydrogen and oxygen. The oxygen would be used as the basis of an atmosphere; the hydrogen would be used to feed the one-cell creatures that would produce our protein. All the energy we'd need would be supplied by solar batteries spread out over the moon's surface. There are no clouds, no mist, no fog or snow to cover up the radiation from the sun, and there would be no wildlife to affect it."

As it was described one can picture a kind of idyllic society in which everything is recycled; in which every mouth is carefully calculated, every bit of input, every bit of output and so on.

While all of this was the speculation of professional soothsayers, there is evidence that our world is changing just about as rapidly as predicted. Possibly because the events are

reported daily or weekly in endless procession, most without fanfare or even celebration, we all mostly ignore or are unaware of their collective impact on our society.

Take, for instance, the following news items culled during one week from a very casual reading of only a few magazines and newspapers:

British-born inventor Eric Cottell has developed an 'ultrasonic reactor' with which to break down and emulsify heavy liquids. Widely used in industry, a recent modification of the device has enough force to tear apart single-cell organisms, releasing their protein for use as a food supplement. He is now experimenting with an emulsion for use in his reactor that will consist of 55 per cent oil, 30 per cent water, and 15 per cent sewage sludge that appears to offer more energy potential than the gasoline we now use to fuel our internal combustion engines. "Recycled sewage," he says, "may well be the fuel of the future."

In Richmond, Va., stands the world's first house built from recycled garbage. The four-bedroom home is almost indistinguishable from a house of conventional materials, and yet is fabricated of aluminum scrap, crushed glass, recycled newspapers, fly ash, wood scraps, recycled nylon fibres, steel mill furnace slag, and recycled copper and scrap cast

iron. Aluminum scrap equivalent to 183,500 pop cans was used for frames, joists, siding, gutters and windows. Recycled garbage was used for compost in the yard.

## ULTRASONICS

At the University of Notre Dame, a new technique for waste purification is being evaluated. Utilizing ultrasonics—vibrations of 18,000 or more cycles per second—the new process is called Sonozone and includes the use of ozone as a sterilant. According to the report, scientists are not exactly sure what takes place when the sewage is subjected to the combination of buzzes and bubbles. However, clumps of bacteria and viruses disintegrate, and longer chemical molecules break apart. The University has demonstrated that less than 60 seconds exposure to the treatment has resulted in 100 per cent destruction of fecal bacteria and 93 per cent reduction of phosphates plus 72 per cent reduction of nitrogen compounds in domestic sewage.

Lake Ontario Cement Limited now has underway a development program to make garbage an alternate fuel source for cement plants. Equipment will be installed to shred garbage and to fire it in the kilns. The company points out that cement is basically composed of the oxides of calcium, alu-

minum, silica and iron—the main constituents of municipal garbage. Ash resulting from the burning would become part of the finished product.

The City of Chicago is installing a solid waste energy recovery plant capable of handling 2,000 tons per day of raw residential refuse. This will provide enough fuel to generate 9.2-million kilowatt-hours of electricity per week, replacing 5,300 tons per week of low-sulphur coal, or approximately 13,700 barrels of No. six fuel oil, or some 78 million standard cubic feet of natural gas per week. The plant will process refuse produced by a city of 800,000 people. The fuel it produces, when used in the power plant, will generate enough electricity to serve over 50,000 homes. Processing of the refuse will also reclaim metals with about 800 tons of steel per week expected to be sold to nearby steel mills.

And so it goes on and on and on. Each and every week there are announcements of innovations, changes, developments.

We may not like all that is going to happen to our world, and the way of life we enjoy. We may have to adjust to new, and sometimes distasteful ways of doing things and of prospering. But rest assured, there really is a future, Virginia, and you will see it dawn each and every day.

# SWARU

## big word in waste

In Hamilton, they call it SWARU.

But depending on who is pronouncing the name of Hamilton's problem-plagued Solid Waste Reduction Unit, it is either spat out expletive-style or rolled lovingly off the tongue.

The skeptics—mostly local politicians who have watched SWARU's cost spiral from \$7.5 million to almost \$9 million—spit the word out because the new concept incinerator has yet to burn garbage to its capacity for any length of time.

The optimists are the consulting engineers who designed it and the Hamilton-Wentworth regional engineers who keep telling the politicians, "leave us alone to work out the bugs."

Since SWARU first fired up its boilers in the summer of '72, those "bugs" have cost the taxpayer well over \$1 million and the engineers are still working on more. They've solved many design problems already and in June, (1974) SWARU was reducing to safe, sterile ash, almost 600 tons of garbage a day—its design capacity.

But the unit, billed as a space-age method of winning the war on waste, still occasionally chokes on the garbage it is supposed to swallow. In fact, many still believe that it could be Hamilton's answer to the Edsel.

### LOYALTY

Gordon Sutin, whose firm

of consulting engineers designed SWARU, insists that it is the most modern approach with present technology for volume reduction and sterilization of a city's garbage. It's an incinerator with a difference, he says, and although no longer directly involved with it, he stands by it with the fierce loyalty of an innovator.

"I always knew it would justify itself," Mr. Sutin said recently. "There's just no question about the concept of the plant—just a few bugs to work out."

So sure of the concept, Mr. Sutin, backed by a group of Canadian companies, offered SWARU to the world market last year.

"We came a close second when we tendered for a job in Hong Kong," he said. "The group who won the contract had already done jobs there before so it was understandable that it won."

### PULVERIZER

The key to SWARU's novel approach to waste disposal is its pulverizers that tear garbage into small pieces. The shredded waste is then burned—mostly in mid air—in a huge furnace.

The heat generates steam—customers for which have not exactly stamped to city hall—and a magnetic separator system yanks tons of metal a day out of the mess. That metal is sold to a Hamilton scrap metal firm.



An operator can check on most of the operations within the plant from the master control room.



The garbage is taken by conveyors to the pulverizers where two men pull out unmanageable items such as car fires.

### LEGACY SPECIAL ASSIGNMENT

*This special report on Hamilton's controversial SWARU incinerator and steam generating plant was prepared as a Legacy exclusive by Ron Dennis, environmental writer for the Hamilton Spectator.*

It's the plant's ability to produce steam that occupies much of Mr. Sutin's thoughts these days. He's currently working on a 1,200 ton per day capacity SWARU proposal for Ottawa, whose myriad of government buildings are almost all heated with central steam plants.

Ottawa also has a garbage problem and Mr. Sutin hopes that SWARU will solve it.

"There's a 24-hour-a-day unlimited demand for steam in Ottawa," Mr. Sutin said. "And we think our plant will help the city's garbage problem as well as being a major supplier of steam."

If Hamilton's SWARU works to capacity, you almost get the impression man has come close to inventing the perpetual motion machine. At peak capacity, the plant is designed to produce 200,000 pounds of steam per hour from 20,000 gallons of water.

### STEAM FOR SALE

It uses 120,000 pounds of steam to run turbines, supplying its own power needs, and can offer the balance for sale to industries in the area.

At Toronto rates last year, Mr. Sutin estimated the excess steam could gross \$200 an hour. Early on, the city thought of employing a high pressure salesman to sell the excess steam but to date, there have been no takers. And Mr. Sutin points out still, that SWARU was never designed to sell steam although the excess became valuable in the past year as the price of fuel soared.

Despite the gremlins that plague SWARU, it scores points in some areas.

Working with garbage has to be a smelly business, right? Sure it reeks like all garbage where it is dumped into the

gaping 30 foot intake pit inside the plant, but a handful of the shredded stuff pulled from the conveyor assails the nostrils with little more than a faint musty odor.

### STAR TREK

And from the road, SWARU looks almost like a modern hospital. Nary a trace of smoke puffs from its huge stack, partly because the shredded garbage burns so efficiently. Electrostatic precipitators on the 165 foot Grecian column-like stack, remove almost all particulate matter.

And inside, automation is so extensive you'd think you were at the controls of the star ship Enterprise of television's Star Trek show. From the master control room, an operator merely glances at a dial to check the weight of trucks. He can see them via closed circuit television.

He directs the trucks, laden with Hamilton's waste, to one side or the other of the intake pit by a series of colored lights. He can even check the heart of the fire in the furnace or the top of the stack by television.

If he wants to check how full the intake pit is, he merely activates the electronic sonar scanners.

Huge conveyors then take the garbage to the pulverizers where two men using long rakes pull out unmanageable items like car fires. They are the last two men to lay hands on the garbage.

Then the magnetic separators take over. They too were problem ridden at first snapping up all sorts of waste that had become entangled with the metal but a Hamilton firm, M and T Products, went to work on that gremlin and installed a more efficient unit.

In the furnace, the shredded garbage floats from the top but by the time it reaches the bot-

tom, between 60 and 75 per cent of it has been burned in a fireball of 2,500 to 3,000 degrees. Those pulverized pieces of glass, a major grate jammer for conventional incinerators have no time to heat up and melt before they fall through the grates at the bottom.

### ASH FILL

Another conveyor belt then dumps the resulting ash outside where trucks take it to the landfill site right on SWARU's own property sufficient to take a three or four year supply. Mr. Sutin hopes that the city may eventually be able to sell it as fill because it packs readily and can bear the weight of a truck within three weeks.

Currently, regional engineers are hoping that the garbage gulper's problems are little more than heartburn and not something more serious like the incinerator's equivalent of a bowel blockage.

Garbage is only dumped at the plant during daylight hours, explains Dave Harris of the regional municipality's engineering department. That means a huge storage tank holding the shredded garbage is part of the system so it can supply the furnaces with fodder 24 hours a day.

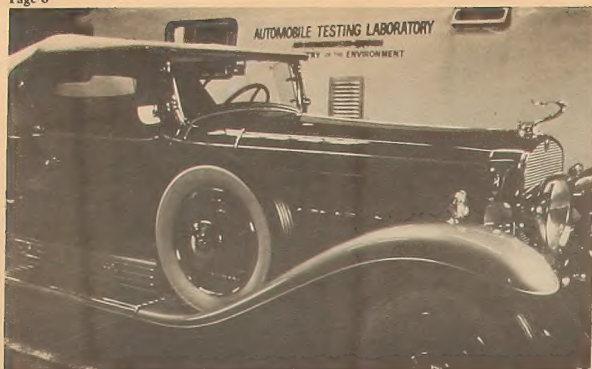
Improving the conveyor system and the pulverizers are the major problems faced at present, Mr. Harris said.

"We may have to install certain major equipment like additional conveyors but we are hoping minor modifications will clear up the problem," Mr. Harris said.

"Sure it's had problems. It's a new concept but we're quite hopeful we can clear them up."

It's that magical peak capacity the engineers are working towards because it means gobbling up 600 tons of garbage a day and spitting out a mere 60 to 90 tons of sterile ash.

And it also means disposing of a Metropolitan area's residential trash for what has become a trifling \$8 a ton, the engineers point out.



Environment Ontario staff tests two Craven Foundation classic cars.

## Testing the classics

How far has the automotive world gone in designing efficient transportation machinery?

Emission tests on motor vehicles and air pollution controls on engines are a long, heavy and powerful 1931 Cadillac roadster—a two-passenger giant propelled by the biggest, most powerful engine available in the line. The powerplant on this car was the 452-cubic-inch V-16. Originally the car sold for \$8,000, and its current market value according to curator Frank Francis is "about \$70,000."

In this light, Legacy staff decided that it would be an interesting exercise to take two old cars and put them through the standard Ontario hot cycle test.

The cars were readily available. The Craven Foundation, which maintains a collection of immaculate vintage autos for exhibition, offered a free choice of more than 50 classics.

Two were chosen from the selection at the foundation's Toronto headquarters, one to represent basic transportation and one to represent total luxury and extravagance.

The economy model was actually a truck—a 1924 Ford Model T panel delivery. This

was a wooden body placed on the basic frame of Henry Ford's first car for the common man, powered by a 176-cubic-inch four cylinder engine.

The luxury model was a long, heavy and powerful 1931 Cadillac roadster—a two-passenger giant propelled by the biggest, most powerful engine available in the line. The powerplant on this car was the 452-cubic-inch V-16. Originally the car sold for \$8,000, and its current market value according to curator Frank Francis is "about \$70,000."

The carburetion on both cars was relatively primitive by today's standards. Both engines were well-tuned and well maintained, but they had travelled over a lot of road. This was a consideration, because emissions increase with normal wear.

The cars were not expected to come close to current standards. In their day, there was no concern about what came out the exhaust system.

But they came through the tests surprisingly well.

The test by Environment Ontario staff is done in stages.

The car is started and carbon monoxide and hydrocarbons are measured at slow idle and at fast idle. Then the car is put into gear on the dynamometer to measure the engine under normal driving load at various speeds. The car was run at speeds from 10 miles per hour to 30 miles per hour and the gases are measured and recorded on a continuous chart recorder.

The Cadillac showed the highest level of hydrocarbons at idle with 1,068 parts per million (ppm) in the exhaust. The highest level of hydrocarbons at speed came from the Ford—450 ppm at 10 mph, which dropped to 320 ppm when the manual spark control was retarded.

The chart shows the full range of test results, and as a standard for comparison, the Ministry's auto emissions specialists provided information on the levels considered acceptable for 1968, 1969 and 1970 cars.

The chart shows that the classic cars in some respects come close to modern standards.

Mr. Francis was not too surprised at the results when he arrived half way through the testing. He had confidence in the machinery he tends. But he had some anxious moments as the test crew hooked up equipment to the Cadillac for the 50 mph test.

His concern was not for any mechanical fragility in the car. He'd spent 1,500 miles behind the wheel of the roadster during the summer. "It cruises nicely at 75," he said.

He was worried because the test crew were using the running boards to get into and out of the car. Mr. Francis has to maintain the cars in as perfect a condition as possible and the slightest flaw would mar an otherwise faultless showpiece—a zipper or even a button scraped carelessly across the finish would mean a complete and expensive repaint.

## Briefly: of grass and water

### STUDENTS PARK FUND

Students Park Fund, an association of Hamilton area high school students were presented with the annual conservation award recently by the Federation of Ontario Naturalists.

The students raised \$27,000 for the Hamilton Region Conservation Authority which, with special provincial grants permitted the purchase of 100 acres of parkland along the Niagara escarpment.

### COMPOSED COMPOSTING:

In a Swedish home, Rikard Lindstrom and his son Carl have been living with a 10-foot long fiberglass container in their basement composting much of the waste generated in the house. One chute feeds the container from the bathroom and another feeds kitchen wastes down, replacing a garbage can. Water wastes from baths, dishes and laundry go elsewhere, but the local municipal services are spared the normal load of flushes and kitchen garbage.

As the pile accumulates, it is supplied with air and vented for aerobic decomposition and evaporation. The final product is a dry, black, odorless humus, approved as fertilizer by the local health authorities. The unit produces 70 pounds of fertilizer per person a year and the neighbors have not had a single odor complaint.

### ROLLING ON RUBBER

Metro Toronto's J. D. George is working on a scheme to use the rubber from scrap tires in road construction. In Phoenix, Arizona badly cracked pavements in the streets and airport are treated with a hot-sprayed ship-seal coat (three eighths of an inch thick) of asphalt modified with granulated rubber. Mr. George has arranged to co-ordinate research with the City of Phoenix and the State Highway Department of Arizona.

### HIGHS AND LOWS

People feel low in the highs and get high in the lows. A theory linking emotional and psychological trends to barometric pressure in this way and to air pollution and bad news has been presented by a University of Pennsylvania research team.

The team's study suggested links between violence and neuroses and higher levels of sulphur dioxide, oxidants and suspended dust, smoke and haze—with irritation of the lungs leading to increased anxiety, drug use and violence.

### DRIVER ATTITUDES

Canadians are willing to pay for pollution-free cars but there are limits to the amount they are willing to spend, according to an Environment Canada study.

Drivers in Montreal, Toronto, Edmonton and Vancouver were surveyed. Half of them were willing to pay \$50 more for additional controls, 40 per cent would put up \$100, but only 10 per cent would go as far as \$150.

### DEGRADATION STOPPED

The historical degradation of the Great Lakes has been stopped, the International Joint Commission announced in its latest report.

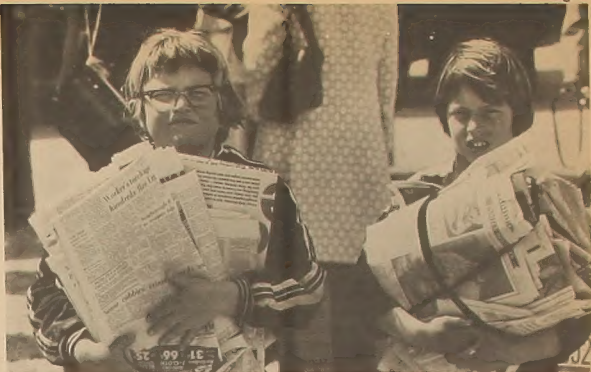
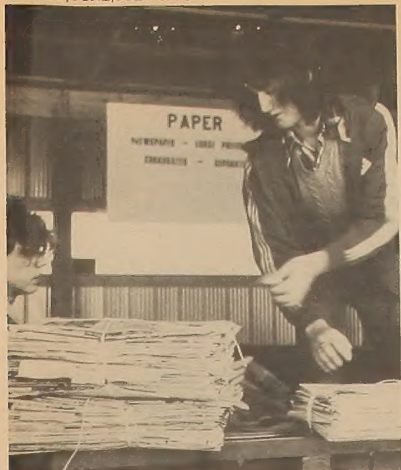
While both Canadian and U.S. programs for control of municipal sewage discharges into the Lakes appear to meet IJC standards, the Commission expressed doubt that the 1975 target date for the Lakes cleanup would be met in all respects. The Commission noted water quality improvements in many areas and a marked decrease in some waste loadings such as phosphorus.

### RESULTS

SPEED	CO	HC
<b>Model T Ford</b>		
Idle	6	550
Fast idle	7.7	250
10 mph	10	450
10 mph (retard)	10	320
20 mph	10	420
30 mph	8.5	290
<b>Cadillac V-16</b>		
Idle	7.7	1068
Fast idle	7.2	400
20 mph	6.8	260
30 mph	6.2	230
40 mph	5.3	160
50 mph	2.5	160
<b>1968 auto</b>		
Idle	4.5	450
Fast idle	3.0	350
<b>1969 auto</b>		
Idle	3.5	250
Fast idle	1.8	200
<b>1970 auto</b>		
Idle	2.5	200
Fast idle	1.0	150

In all tests, carbon monoxide (CO) is expressed in percentages and hydrocarbons (HC) in parts per million.





### Paper party at the depot . . .

Everyone in Unionville was invited to the official opening of the town's encyrcled recycling depot. Admission price was a bundle of newspapers. Musical entertainment was provided

and the Pollution Probe caravan was on display for public viewing. Opening ceremonies, performed by Mayor Anthony Roman, were followed by refreshments.

## Cottagers band together to protect their lake

Cottagers on Six Mile Lake in Muskoka take an active part in the fight against pollution. Over 450 people belong to the largest cottage association in the area, which works with both local and provincial governments to eliminate existing sources of pollution and to prevent further contamination to their cottage area.

The association keeps its members up to date on the passage of any new anti-pollution legislation which will affect cottagers. The new regulation on septic tanks is of particular interest. In some

instances the association presents briefs to the local government indicating their feelings towards a proposed by-law. One brief concerned the amount of lake frontage required to build on a lot.

Pamphlets on pollution are obtained from the Ministry of the Environment and disseminated through the local marinas and also at the annual regatta.

#### SAMPLES

Water samples are regularly sent to the Ministry of Health Laboratory and thought is now

being given to a special study on water clarity.

Through a meeting with the mayor the association was able to persuade the municipality to take action on an abandoned car problem.

"We are not a banner waving group," says past president Art Robinson. "Our aim is to understand and then to co-operate."

Several letters have been written to various government officials regarding further development on the lake. The association is concerned that additional people could cause a

problem because of the increased number of septic tanks and boats. It would like the government to survey the lake and to decide how many more cottages the lake can accommodate without creating a health hazard. The association will then go along with whatever the government decides.

Individual cottage owners are also reminded if one of their activities is resulting in a pollution problem. For example, a cottager burning leaves is informed of the air pollution problem involved as well as the fire hazard. Mr. Robinson says, "We talk to the person. We don't threaten because we realize that we will have to live with the person afterwards. But the cottagers on our lake are so good that all it needs is a little reminder and they are willing to co-operate."

#### ACTIVITIES

The Six Mile Lake Cottage Association is also involved in other activities. Various social activities are planned during the summer months, many for teenagers. "As the young people get older you need something to encour-

age them to keep coming up to the family cottage," says Mr. Robinson.

Each member receives a directory of everyone on the lake and a copy is supplied to the local police for emergencies. Cards stating the nearest hospital, fire station, etc. are also distributed. These are particularly useful if you have rented your cottage. The association also turns out two news bulletins a year—before and after the cottage season.

Another project within the association is the design of a signal system for each cottage if help is needed in the case of fire, accident or illness.

Unlike many organizations where only a few people are active, the Six Mile Lake Cottage Association boasts of having an excellent attendance at most of their functions—even the annual winter meeting in Toronto.

Mr. Robinson says, "what pleases me most about the association is the interest of our members. It is easy to provide the service of our time to people who are so pleased with any assistance."

## Are you bothered by mosquitoes?

The proper use of insecticides can provide some relief from mosquito problems.

But an Environment Ontario study of aerial application of chemicals to kill mosquito larvae had no significant effect on the number of mosquitoes in Mara township where the experiment was carried out. Vegetation in the marshy area sprayed kept much of the insecticide from reaching the water where the larvae grew.

Mosquitoes breed in ponds formed after spring runoff or in any stagnant pool of water that exists for more than two weeks. Several generations of insects are produced over spring and summer and there are several species of mosquitoes that thrive in Ontario.

#### EFFECTIVE CONTROL

To be effective on a community basis, a control program must cover potential breeding sites for at least a mile around the area to be protected. Some insects fly, or are carried by the wind, for a mile or two.

Eliminating small, standing pools and drainage ditches helps with small local problems. When this is not possible, breeding locations can be located by sampling with a small dip net. Where larvae are found, the edges of the pond under any overhanging grass should be sprayed with the proper chemicals registered and sold for this purpose.

A permit from the Ministry of the Environment is required for spraying chemicals on ponds unless they are completely enclosed within the applicant's property.

#### SOME RELIEF

Fogging operations can provide temporary relief from adult mosquitoes. These are permissible and safe when the proper chemical is used in accordance with the manufacturer's directions.

Proposals for broader larvicide programs developed by local authorities or industries, must be reviewed by the Ministry. Permits will be issued where the proposals are considered effective and acceptable to the environment.

Application forms and instructions are available on request from the Ministry of the Environment, Pesticides Control Section, 135 St. Clair Ave. W., Toronto M4V 1P5.

## After 54 years . . . water piped from Lake Erie

The Kent County Regional Water System, undertaken by the Ontario Ministry of the Environment for the City of Chatham, consists of a 36-inch diameter pipe line, 14 miles in length and delivers Lake Erie water to the City water plant for treatment.

Designed by Consulting Engineers, Proctor & Redfern Limited, the project commenced in 1970 and cost \$5 million.

The system consists of a 48 inch diameter water intake extending some 2500 feet into Lake Erie, a pumping station at the lakeshore near Cedar Springs, a standpipe at Cedar Springs and the pipe line to the water treatment plant. Capacity of the system is 15 million imperial gallons per day, but this can be increased to 30 mgd as circumstances warrant.

The system provides Chatham

with a vastly improved raw water supply to its treatment plant. For example, the recent raw water turbidity of Lake Erie water supply was 8 parts per million on a day when the City's former raw water supply was in excess of 100 ppm.

Interesting features of the new system are its automatic control and operation, and the use of a hydraulic surge and storage tank at Cedar Springs.

and brook trout, have been planted in Lake Huron for several years.

To improve Detroit-area fishing, Michigan is releasing hatchery-bred chinook salmon and rainbow trout at the head of the Detroit River.

This tank of 800,000 imperial gallon capacity is located at the high point of the transmission main, which is located about 1½ miles from the Lake. From this point water is fed by gravity to the Chatham Water Treatment Plant. A regulating station near the plant controls flow.

The pipe line project was considered many times over the past seventy-five years. Historically, it is interesting to note that as early as November 1919 E. M. Proctor, for many years Senior Partner in Proctor & Redfern, recommended a Lake Erie supply for the City of Chatham at an estimated cost of \$600,000. Fifty-four years later the pipe line became a reality.

The new pipe line was designed and managed by G. U. Proctor and Dr. R. Fisher.

## Great Lakes restocked with hatchery-bred fish

Ontario and U.S. Great Lakes states are releasing about 18 million hatchery-reared fish in the Great Lakes and tributary streams this year.

The stocking program includes walleye fry and a dozen

species of salmon, trout or hybrid fish. This year 350,000 lake trout will be released into Lake Huron and 65,000 lake trout in Lake Ontario. In addition, a new hybrid—backcross splake, a splake-lake trout hybrid—will be planted in Lake Huron. Splake, a hybrid of lake

# EcoLogic

## Priorities

From time to time over the past year there have been statements to the effect that energy takes priority over the environment.

There are those who think some compromises in environmental protection should be made to cater to supply limitations on fuel—whether those limitations are real or imaginary.

It has even been suggested that environmental concern and pollution are passing fads—whims that held the public's attention for a time, but which are now passe.

Don't believe it for a second.

### NO FANCIES

The protection and restoration of our natural environment and the conservation and proper use of our natural resources are not passing fancies. They are facts of life, essential to the enjoyment of life in this province and on this earth.

Environmental considerations are rapidly becoming a part of our governments, our industries, our communities and our individual lives.

The holdouts who refuse to recognize this are the ones whose attitudes and methods will pass.

### FOR THE FUTURE

In this issue of Legacy we report the beginning of two major reclamation projects of great significance for the future of Ontario. The material we now call waste and refuse is produced in this province at a fantastic rate—thousands of tons a day.

This will be developed as a resource—raw material for re-use and for energy supply.

In these projects and in Hamilton's SWARU plant—the subject of a special report in this issue—the basics of making reclamation practical and profitable are being worked out.

Other articles refer to the work under way to protect and restore cottage country lakes, and the important role individual cottagers concerned about their lakes are playing.

### DIRECT BENEFITS

The co-operation of individual, concerned citizens and the willingness of these citizens to correct problems has had direct benefits in terms of pollution control.

And there are thousands of concerned and active citizens in Ontario who come to grips, day by day, with waste and pollution. Some participate in water quality testing programs. Some organize and operate recycling depots.

Anyone who really wants to, can find some way of contributing to the betterment of the environment in this province.

And as long as there are people in Ontario who are concerned and who find ways to do their part, environmental issues will never be a passing fad, but a vital part of our society.

## Pollution and energy

Effective pollution control is an inherent part of our national energy policy, according to a recent policy statement from the federal department of Energy, Mines and Resources.

The department estimates that \$7 to \$10 billion may be spent on environmental protection for energy activities over the next decade. This is based on estimates that Canada's energy production will double over the 10-year period.

Roughly half of the expected \$10 billion expenditure in the energy sphere will be extra

costs in transportation and in fuel used for transport.

Environmental assessments, redesign, controls and procedure changes and rehabilitation of land involved in the generation of electric power, and the cost of changing thermoelectric plants to cleaner fuel, will cost an estimated \$1.8 billion.

Environmental protection and restoration costs for energy used in industrial and domestic purposes other than electric power and transport are expected to total about \$7 billion.



Ministry  
of the  
Environment

Hon. William G. Newman,  
Minister

Everett Biggs,  
Deputy Minister

Published bi-monthly by the Ministry of the Environment, Information Services Branch, 135 St. Clair Avenue West, Toronto M4V 1P5, Ontario for those interested in the many facets of environmental enhancement. Reproduction of articles authorized without further permission.

Editor William M. Dodds  
Director of Information Services M. F. Cheetham



## Water carriers praised

If someone asked you what mode of transportation has the lowest overall effect on the environment, rail, air or highway would probably come to mind.

You'd be wrong.

According to Toronto Harbor Commission's Project Director Ken Gilbert, shipping is the winner by far in this environmental contest.

After studying the effect of noise and air pollution with regards to air, road and water transportation, Gilbert discovered that the potential of jet and highway travel was marred by unacceptable levels of noise pollution and congestion.

Rail transportation, while not as bad as the other two systems, was still a long way from having acceptable levels.

Gilbert says, "In transportation areas where large technological investments have been made, namely air and highway, the technologies have too often ignored the environmental problems."

### NOISE STUDY

In his noise pollution study, Gilbert used the standard measure of the decibel and adjusted the recorded levels to correspond to the A-weighted sound level values used in engineering studies and transportation systems.

Recent data on noise emissions indicates that diesel trucks emit ranges of 78 to 85 DbA at 50 feet and other trucks and autos produce a 65 to 75 DbA at the same distance. Standing diesel locomotives and moving freight trains produce 82 to 88 DbA at distances of 100 feet.

On the other hand, ships carrying cargoes of 5,400 tons of fuel oil and 5,000 tons of general cargo through the Welland Canal registered 64 and 66 DbA at 30 feet. A single vessel under ballast registered 67 DbA at 111 feet.

Gilbert says, "Compared to the movement of goods by truck or train, a ship carrying either 18,000 tons of iron ore or 5,000 tons of general cargo produced peak noises that are 75 per cent lower than those produced by trucks or diesel locomotives."

### FUEL CONSUMPTION

Gilbert's study also discovered that transportation systems account for more than half of the 174 billion gallons of petroleum consumed in the U.S. He adds, "It is wise to compare the consumption of fuel and pollution emission on a ton-mile per gallon basis, relative to the shipment of goods by truck, train or ship."

"If absolute fuel consumption becomes a primary issue in the transportation field, engineers will discover how extravagant are today's exotic forms of transport."

Gilbert found that air freight yields up to 10 cargo ton-miles per gallon, trucks 54 and railway freight 193, while ships on the St. Lawrence Seaway get anywhere from 247 to 1,050 ton-miles per gallon depending on the type of cargo.

His air pollution studies show that ships produce 33 per cent less pollutants than diesel trains and 373 per cent less than diesel trucks based on cargo carried.

Gilbert notes that a comparison of the emissions pro-

duced from the transporting of a million tons of cargo show that 7,440,000 cubic feet of emissions would be produced by freight trains, 26,500,000 cubic feet by diesel trucks and only 5,600,000 cubic feet by ships.

### OIL SPILLS

Some critics bring up the problem of oil spills causing great amounts of pollution, but Gilbert says that records over the past five years show an average of 18 oil spills occur in Toronto Harbor in a single year.

"In all areas of oil pollution, ships are the most heavily policed."

He also notes that "generally speaking, the quantities involved from spills originating at industrial plants have been larger than from ships."

Gilbert also points out that the Seaway was a much less costly expenditure than either the Gardiner or Spadina Expressways. "The Gardiner cost \$17 million a mile, while the Spadina Expressway was placed at \$22 million a mile. The total Canadian cost of building the more than 2,000-mile long Seaway was equivalent to building 29 miles of expressway."

Jack Jones, chief engineer for the Toronto Harbor Commission, says, "What we want to see is greater utilization of the Seaway. Let's realize its potential before we go off in all directions building roads and highways. All methods of moving goods are important. I'm not denying that. But here we have a relatively pollution-free highway, 2,000 miles long. Let's see what we can do with it."